



Preference for Online Social Interactions Twenty Years Later: Reconceptualizing the Construct and Its Role in Internet-Related Behavioral Addictions

Silvia Casale¹ · Julia M. Balcerowska-Detmer² · Simon Ghinassi³

Received: 21 May 2026 / Accepted: 2 September 2026
© The Author(s) 2026

Abstract

Purpose of Review This manuscript presents a conceptual reframing of a construct that has traditionally played a central role within the cognitive-behavioral model of problematic Internet use: the Preference for Online Social Interactions (POSI). This concept has been introduced to capture a key cognitive risk factor for the lack of control over multidimensional Internet use, particularly Internet communicative services (e.g., online social networks).

Recent Findings Given the evolution of digital communication, POSI's original definition—based on a binary distinction between online and offline social relationships—may no longer have the same pervasiveness and effectiveness in describing, representing, and encapsulating the individual experience that may serve as a gateway to problematic Internet uses. Drawing on a narrative review of studies that have examined POSI in relation to various forms of problematic Internet use, we propose that this concept should now be reframed to emphasize rigidity and a predominant orientation toward the online environment.

Summary Under this updated conceptualization, POSI may still function as a relevant cognitive precursor of the behavioral dimensions—e.g., loss of control—characterizing several problematic Internet-related behaviors. Although the relevance of POSI might vary across these behaviors, we discuss theoretical and empirical reasons to consider it involved in Problematic Social Media Use (PSMU), Gaming Disorder (GD), Gambling Disorder, Compulsive-Shopping Disorder (CSD), Compulsive Sexual Behavior Disorder (CSBD), Problematic Pornography Use (PPU) and even in the emerging use of Artificial Intelligence (AI) as a surrogate for human relationships.

Keywords Artificial intelligence · Gambling disorder · Gaming disorder · Preference for online social interactions · Problematic pornography use · Problematic social network use · Problematic social media use

Introduction

The first studies on technology addiction date back to the early 1990s. By comparing the excessive use of fruit machines with that of video games, Griffiths highlighted, through a series of studies, the importance of the specific features of the machines (e.g., graphics, lights, sounds) in both phenomena [1–4]. Although a fruit machine is undoubtedly a form of gambling as it involves financial rewards, Griffiths [5] noted that fruit machines and video games resembled each other in terms of the addictive potential of the machines' features. These pioneering findings highlighted the role of the medium itself rather than the specific activity, and the importance of structural characteristics of technologies in shaping addictive behaviors.

✉ Silvia Casale
silvia.casale@unifi.it

Julia M. Balcerowska-Detmer
julia.balcerowska@ug.edu.pl

Simon Ghinassi
simon.ghinassi@unipi.it

¹ Department of Health Sciences, Section of Psychology, Building 26, University of Florence, via di San Salvi 12, Florence 50135, Italy

² Institute of Psychology, University of Gdańsk, prof. Marii Janion 3, Gdańsk, Poland

³ Department of Surgical, Medical and Molecular Pathology and Critical Care Medicine, University of Pisa, via Savi 10, Pisa, Italy

Very similar observations were highlighted by Kimberly Young [6], who introduced the concept of Internet addiction (impulse-control disorder, which does not involve an intoxicant), and emphasized the role of the medium itself as having potentially addictive properties. Although Kimberly Young raised that the Internet is not a subject of addiction, the more interactive the application utilized by the user, the greater the risk of developing addictive use [6].

Overview of the First Models of Problematic Internet Use (PIU)

Nowadays, most technology use involves the use of the Internet. Concerns about the addictive potential of the Internet and attempts to find a diagnostic and theoretical framework for such problematic use have emerged since its advent in 1996 [7, 8]. Theoretical models of Problematic Internet Use (PIU) differ in the extent to which they consider the Internet's peculiar features as contributing factors to problematic use. Some frameworks emphasize the role of Internet-specific features in problematic use (e.g., the updated cognitive-behavioral model; [9]), while others downplay their relevance (e.g., the six components model; [10]). One of the first theories that takes these two perspectives into account was Davis's [11] cognitive-behavioral model of Pathological Internet Use (PIU). This model firmly distinguished between forms of PIU in which the Internet is nothing more than the environment that provides access to the object of one's addiction (i.e., Specific Pathological Internet Use; SPIU), and forms of PIU that are specifically related to the structural characteristics of the Internet and/or the machine (i.e., Generalized Pathological Internet Use; GPIU). SPIU was supposed to involve overuse or abuse of content-specific functions of the Internet (e.g., gambling, shopping, viewing sexual material), and would likely be manifested in some alternative way if the individual were unable to access the Internet. In SPIU, the characteristics of the Internet were considered irrelevant to the development and/or maintenance of PIU, since the Internet was supposed to be merely a vehicle for accessing the real object of the addiction. On the opposite, GPIU was supposed to occur when the individual developed problems due to the unique communicative context of the Internet. For this reason, although it had been defined as "generalized", GPIU was expected to be mainly associated with online chatting and e-mail dependence. In GPIU, the features of Internet services that provided communication opportunities were supposed to play a significant role, as they were assumed to be related to the unique communicative environment of the Internet. Through a series of studies that began in 2002 and culminated with the publication of the updated cognitive-behavioral model of GPIU in 2010, Caplan [9, 12–14]

closely examined the potential pathways toward GPIU and introduced the concept of Preference for Online Social Interactions (POSI), positioning it as a key variable in the development of problematic use of Internet communicative services. POSI was defined as "a cognitive individual-difference construct characterized by beliefs that one is safer, more efficacious, more confident, and more comfortable with online interpersonal interactions and relationships than with traditional FtF [face-to-face] social activities" [13, p. 629].

The present work discusses the concept of POSI by bringing together the scientific evidence that substantiates its relevance for specific forms of problematic Internet use, such as Problematic Social Media Use (PSMU) and Gaming Disorder (GD), and discuss its implications for online forms of behavioral addictions, i.e., Gambling Disorder, Compulsive Shopping Disorder (CSD), Compulsive Sexual Behavior Disorder (CSBD), and Problematic Pornography Use (PPU). The disorders considered in the present manuscript are grounded in the International Classification of Diseases, 11th Revision (ICD-11), which classifies Gambling Disorder and GD under "disorders due to addictive behaviors", and in the proposal advanced by some scholars [15] to conceptualize pornography use disorder, buying-shopping disorder, and social network use disorder as disorders due to addictive behaviors. Secondly, in the present work, we discuss that the assumptions underlying POSI original formulation are now outdated — particularly the view of online and offline relationships as two discrete and independent relational contexts. On this basis, we propose a revisitation of the construct of POSI resulting from the evolution of digital communication. Finally, we discuss the potential role of POSI in emerging domains such as conversational Artificial Intelligence.

The Construct of Preference for Online Social Interactions in the Updated Cognitive-Behavioral Model of GPIU

Theories on the differences between FtF communication and computer-mediated communication (CMC) emphasize that the main differences between them lie in the greater control and the greater audiovisual anonymity afforded by computer-mediated interpersonal contexts. CMC exchanges are easier to control and strategically manipulate than FtF interactions and people can manage preferred cues while masking or editing the undesirable and uncontrollable ones [16, 17]. On this premise, Caplan [14] proposed a social skills account of GPIU, suggesting that individuals who perceive themselves to have low self-presentational skills are especially likely to appreciate CMC features. Within this line of reasoning, POSI was defined as a preference for this type

of interaction, grounded in beliefs that one is “better” (i.e., more effective, more confident, and feels safer and more comfortable) in CMC than in FtF [13]. A few years later, Caplan [9] updated the cognitive-behavioral model, restructuring it around the central role of POSI and defined it as the first GPIU symptom from a temporal point of view, thus preceding other cognitive (e.g., preoccupation) and behavioral (e.g., loss of control) symptoms of addiction that ultimately result in negative outcomes [9, 14]. Moreover, from the perspective of the disorder’s evolution, POSI is a necessary condition for the development of all other cognitive and behavioral symptoms. In fact, Caplan [9] defined POSI as a cognitive precursor to the other GPIU dimensions outlined below. In detail, this model posits that individuals who prefer online social interactions are more likely to expect that CMC use facilitates some change in negative affective states and alleviates the distress associated with face-to-face meetings, because—as already described—the unique feature of CMC gives them greater self-presentational control and confidence. This component was named “Mood Regulation”. POSI was also expected to have a direct and indirect effect on Deficient Self-regulation, defined as a state in which conscious self-control is relatively diminished [9, 18]. Such a deficiency reflects the interplay between two interrelated phenomena, i.e., obsessive thought patterns involving Internet use (named Cognitive preoccupation) and the inability to control or regulate one’s online behavior (namely, Compulsive use). Those who think they are more comfortable and effective in CMC will develop obsessive thought symptoms regarding their Internet use and are expected to show reduced control over use. Finally, POSI indirectly predicts, via Deficient self-regulation, the extent to which an individual experiences personal, social, and professional problems resulting from Internet use, here named Negative Outcomes. Briefly, this perspective argues that if an individual did not feel more comfortable and effective in CMC than FtF relationships (that is, if he/she does not prefer online social interactions), he/she would not lose control over the use and engage in compulsive and dysregulated use of services that allow social communication. Figure 1 illustrates the hypothesized links among the model components.

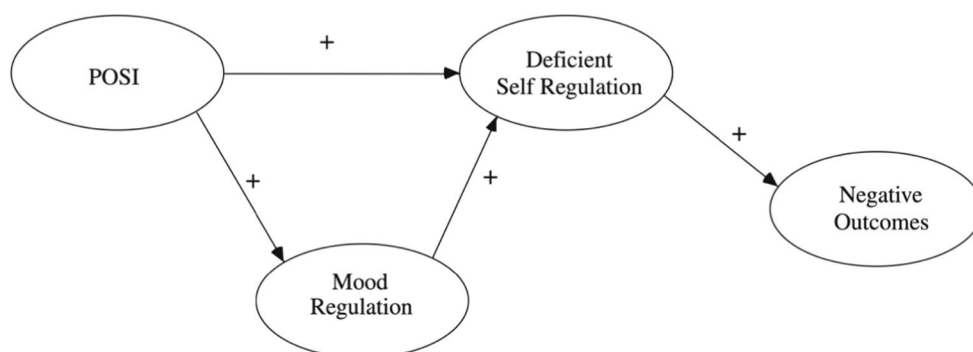
Empirical support for the key role of POSI in the hypothesized conceptual model has been obtained in different cultural contexts, including France [19], Mexico [20], Portugal [21], Spain [22, 23], Italy [24, 25], Poland [26], and Japan [27]. Although these studies adopted cross-sectional designs, all supported the basic assumption of the model that POSI is positively associated with mood regulation and deficient self-regulation, which, in turn, was associated with negative consequences. Moreover, some studies have also shown that the relationships between the model components are invariant across gender [23, 28], and across different measuring contexts (i.e., offline, and online) [26]. The only longitudinal study on this topic confirmed that POSI positively predicted negative outcomes associated with Internet use six months apart [29].

Beyond GPIU: The Construct of Preference for Online Social Interactions across Internet-Related Behavioral Addictions and Related Phenomena

POSI has received growing attention both as a factor implicated in the problematic use of specific online services and apps and as an independent construct. As for the latter, some studies have explored its potential affective or cognitive antecedents as well as the link that POSI has with other individual differences, including social anxiety [30], emotion dysregulation [31], loneliness [32], emotional intelligence [33], and self-esteem [34]. As a side note, the construct of POSI has also been studied in relation to functional and dysfunctional Internet use-related behaviors that are independent from PIU. For instance, various studies have suggested that POSI might have a role in cyberbullying involvement [35], phubbing [36], online self-disclosure [37], online disinhibition [24], online affective-sexual relationships [38], increased photo-editing tendency [39], and technostress [40]. This growing interest in POSI as a standalone construct is also reflected in several attempts to develop a specific measure —i.e., independent of GPIU evaluation—for its assessment [41].

In the next paragraphs, we briefly outline how POSI has been incorporated within more recent theoretical

Fig. 1 The cognitive-behavioral model of Generalized Problematic Internet Use. Reprinted from Caplan [9]. Copyright 2010, with permission from Elsevier.



frameworks, along with the empirical support it has received as a key variable for understanding various forms of potential or established behavioral addictions.

Problematic Social Media Use

When it comes to problematic use of specific Internet services, POSI has drawn increasing scholarly interest as a potential psychological process involved with social media use. With the spread of Facebook, a growing consensus emerged that, if problematic Internet use is defined by its communicative nature, it is expected to concern social media platforms, as most serve a social networking function. While this manuscript is not intended as a systematic review, a SCOPUS search indicates that approximately twenty-five studies to date have investigated POSI in the field of Problematic Facebook Use (PFU) [25, 42] and “generalized” Problematic Social Media Use (PSMU) [43–45]. More recently, some authors have explored the role of POSI with respect to problematic use of applications that allow social connections, such as WhatsApp [46] and Dating Apps [47, 48]. Overall, these studies indicate not only that POSI significantly contributes to the loss of control over social media use but also that it represents a central symptom of PSMU [49]. Further, the compelling empirical evidence concerning the role of POSI in PSMU led to its inclusion in a theoretical proposal advanced to account for developmental pathways towards PSMU [50]. To account for the contradictory empirical findings regarding the role of traits such as extraversion, narcissism, and loneliness in relation to PSMU, Wegmann and Brand [50] suggest that PSMU may emerge through two distinct pathways: one fear/compensation-driven (primarily characterized by negative reinforcement) and one reward-driven (mainly characterized by positive reinforcement). From the authors’ perspective, POSI—as well as loneliness, depressive symptoms, or social anxiety—represents a predisposing variable within the first pathway (whereas psychological dimensions such as narcissism, need for popularity, and/or need for social recognition would be involved in the second pathway). Despite POSI not being included in the latter pathway, a very recent study employing Necessary Condition Analysis within the updated cognitive-behavioral model has shown that certain levels of POSI must be present for negative outcomes associated with social media use to occur [51]. Overall, these results seem to support the proposal that POSI should be considered a specific marker of PSMU [52].

Gaming Disorder

Although it has been recently suggested that POSI is a specific risk factor for PSMU — that is, a factor not implicated

across different problematic online behaviors [53] —, it has also been investigated in relation to Gaming Disorder (GD) symptoms. This scientific interest originated from two inter-related considerations. First, many games provide a virtual space for a range of social interactions. In fact, regardless of the ICD-11 specification that the persistent pattern of gaming behavior may take place either online (i.e., over the internet) or offline [54], most games offer players various ways to interact, both through gameplay actions (e.g., combat) and embedded features that enable communication (e.g., in-game chats) and the sharing of personal moments [55, 56]. What is more, reported cases of problematic game behavior have increased since the introduction of the social dimension in video games [57]. Second, as observed in empirical research on PSMU [58], the number of studies showing a positive link between social anxiety and GD symptoms has begun to increase [59]. A SCOPUS search shows that to date six studies have investigated POSI in the context of GD symptoms. Haagsma et al. [60] showed that POSI is linked to negative outcomes related to one’s online gaming both directly and indirectly through emotion regulation. Männikkö et al. [61] revealed that POSI predicted increased problematic gaming symptoms (i.e., salience, tolerance, mood modification, withdrawal, relapse, conflicts, and problems) in a group of adolescents and young gamers. Yet, the self-report measure used in this study to assess POSI included social motives (e.g., “Social communities of digital game players are important to me”) and therefore did not require comparing one’s feelings in online and offline relationships. By clearly distinguishing between POSI and social motives (e.g., “gaming because it provides company”), a subsequent study found that only POSI mediated the link between social anxiety and GD symptoms [62]. Such a result provides robustness to the construct validity of POSI, showing that satisfying the need for belongingness or relatedness through online gaming is not, per se, a risk, whereas being safer and more comfortable in these relationships could be. Further, POSI was positively associated with both beliefs that online gaming is an effective strategy for cognitive-affective self-regulation (i.e., positive metacognitions about online gaming) and beliefs about a lack of control and the dangers of online gaming (i.e., negative metacognitions about online gaming). In another study comparing different gamer profiles (i.e., avoidant, engaged, relational, and dysregulated), dysregulated players were characterized by high distress, emotional dysregulation, substance use, and the POSI [63]. Finally, Liu and Peng [64] proposed a construct inspired by POSI, i.e., the preference for virtual life (i.e., “one’s cognitions or beliefs that one will perform better, feel better about oneself, and perceive to be better treated by others in the online virtual game world than in offline or real life”, p. 1307). They found that this

preference was positively related to withdrawal-like effects when playing massively multiplayer online games was not available, and it explained 26% of these symptoms.

Compulsive Sexual Behavior Disorder (CSBD) and Problematic Pornography Use (PPU)

Other phenomena that have become widespread because of the development of the Internet are online sexuality-related activities, which could be defined as Internet sexuality [65], online sexual activities [66], or digisexuality [67]. Based on the recent work of Döring and colleagues [68], sexual interaction in digital contexts could be divided into three types: *sexual interaction through*, *via*, and *with* digital technology. Sexual interaction *through* digital technology refers to the interpersonal sexual interactions in face-to-face contexts that have been started digitally or are accompanied by digital technology. Sexual interaction *via* digital technology refers to interpersonal sexual interactions that take place in computer-mediated contexts or within an interactive immersive virtual reality system. Finally, sexual interaction *with* digital technologies refers to sexual interactions between the person and the technological artifact in the role of an interaction partner. For the first type, the online environment is only a platform to initiate and perform face-to-face sexual activity. On the contrary, the second and third types of sexual interaction are primarily focused on online interactions, both as CMC and as a sexual interaction with a media persona. In terms of the sexual interaction *with* digital technology, most behaviors involve some form of interaction with an online persona that involves the use of online pornography [69, 70]. This is especially crucial, as pornography is one of the most frequently viewed types of online content, concentrated on a few major platforms, and mobile devices have become the primary means of access to it [71]. From the Internet-related behavioral addictions perspective, problematic sexual behaviors could be defined as experiencing diminished control over partnered or solitary sexual behavior, which may lead to distress and negative consequences [72]. In this regard, most studies focus either on Compulsive Sexual Behavior Disorder (CSBD) and Problematic Pornography Use (PPU) [73], although CSBD is recognized as an impulse control disorder. Even if digital technologies foster various problematic sexual behaviors online, there is significantly less research on the relationship between both CSBD and PPU, with POSI, than there is on PSMU and GD. Previous studies showed an association between social deficits (loneliness, social anxiety, low self-esteem) and pornography use [74]. One possible explanation is that POSI mediates or strengthens the relationship between loneliness and PPU. Nevertheless, we find only one study that explicitly investigates the relation between POSI and PPU [26]. In

this study, POSI correlated positively but weakly with PPU ($r = .09, p < .05$). By contrast, other GPIU components, i.e., deficient self-regulation, negative outcomes, and mood regulation, showed stronger correlation with PPU. Given the limited knowledge about the relationship between POSI and online sex-related behaviors, it is difficult to unequivocally determine the role of POSI in those behaviors.

Could POSI Have a Role in Compulsive-Shopping Disorder and Gambling?

Since problematic gambling and compulsive shopping preceded the advent of the Internet, the latter was for a long time regarded merely as a vehicle for accessing the object of the addiction [7]. This type of perspective—plausible when Internet was first introduced given the state of digital technology—has long been abandoned, as scientific evidence have clarified the role that specific Internet features (e.g., pop-ups, personalized offers based on previous searches, notifications) play in generating repeated stimulation and promoting cognitive overload and reduced self-control in individuals (see, for example, Rose & Dhandayudham [75], with regard to compulsive shopping). Consequently, both the design features of digital applications and the characteristics of the online environment have increasingly attracted scientific attention in relation to these two problematic behaviors as well.

Various studies have documented that specific motives that appear to prompt online shopping include greater privacy and the possibility of buying without being observed by others (i.e., the social anonymity) [76]. Similarly, for some gamblers, the opportunity to create profiles that can hide one's real identity and to play alone has been reported as one of the reasons that make online gambling attractive [77–79]. In an American Gaming Association study [80], participants reported gambling online not only because it was exciting and entertaining but also for anonymity and privacy. An international sample of online gamblers includes a dislike of the atmosphere of land-based venues and a preference for the pace and nature of interactive game play [81]. Overall, these findings suggest that, for some individuals, the Internet may serve not merely as a vehicle for gambling or shopping, but as an environment in which they feel more comfortable engaging in the pursuit of the addictive object. In contrast to what happens with PSMU and GD, when it comes to compulsive shopping and gambling it could be the reduction of interpersonal contact—rather than the opportunity for it—that plays an important role in explaining the online form of the disorder (if any). That is, in PSMU and GD, the individual feels safer, more comfortable, more secure, and more efficacious in interacting online. In a somehow similar way, in online CSD and interactive gambling, the individual

feels safer and more comfortable engaging in the respective behavior via the Internet.

Summary

Both the already described social skill account of GPIU [14] and the Compensatory Internet Use Theory (CIUT) [82] offer a useful framework for explaining, on the one hand, how the POSI belief develops and, on the other, its link with problematic patterns of Internet use. Both PSMU and GD need to be considered compensatory processes for socially anxious individuals, in which the unique features of CMC play a fundamental role. In fact, online interactions might provide an ideal alternative to physical life social interactions for socially anxious individuals because they are perceived as less risky than the face-to-face ones [60, 83], thus allowing them to exert more control and avoid distress linked to face-to-face social interactions [84]. Although the CIUT does not explicitly refer to POSI, it implicitly theorizes that the online environment can, at least temporarily, provide a context that individuals may subjectively perceive as more desirable than its offline counterpart. Overall, although the near-absence of longitudinal studies prevents clarifying whether a bidirectional effect exists, current evidence nonetheless suggests that the subjective experience of feeling more comfortable and secure in CMC is involved in the loss of control over social media use and online gaming.

Moreover, given the limited knowledge about the relationship between POSI and online sex-related behaviors, it is difficult to determine the role of POSI in those behaviors. However, theoretical perspectives on the various types of online sexual behaviors [65, 68], together with some preliminary studies [26], seem to indicate that this dimension should not be overlooked. Finally, a different line of reasoning may be required for Gambling Disorder and CSD. It does not seem plausible to suppose that POSI is a risk factor for online Gambling Disorder and online CSD, but it could be one of the various factors that could help in explaining why some people mainly rely on the web whereas others, under comparable problematic conditions, disregard this vehicle. To date, the World Health Organization merely recommends that clinicians specify whether gambling is predominantly online or offline [85]. Yet, one of the core components of POSI — the belief that one is safer and more comfortable online — could be crucial in explaining the pathway toward the online form of Gambling Disorder and CSD.

Updating the POSI Construct

Although its original definition dates back 23 years, the construct of POSI seems to attract more scientific attention now than in the past: in the last five years, the number of studies

that have included POSI as a study variable is approximately the same as the total number of studies conducted in the 18 previous years starting from its first definition in 2003 (in May 2026, the Scopus database identified 41 articles published from 2021 to 2026 and 41 articles published from 2003 to 2020). Another indicator of a still ongoing scientific interest comes from a relatively recent review on the screening tools for PSMU in children and adolescents, which highlighted that the most utilized self-report measure for POSI (i.e., the subscale of the Generalized Problematic Internet Use Scale-2) [12], is still widely used and is one of the two self-report measures with the best psychometric qualities [86].

As described, the construct of POSI has been conceptualized as the main cognitive dimension of GPIU. Yet, within its original definition, GPIU referred to problems associated with unique online activities that did not have offline counterparts [13], and the concept of POSI somehow implied a binary distinction between online and offline environments. Notably, about fifteen years ago, such a dichotomy was already considered oversimplified [24, 87]. Indeed, communication technologies that were popular when the Internet was introduced (e.g., Multi-User Dungeons and public chat rooms) were typically used for communication between strangers, whereas for a considerable time now, most used online social media (e.g., Instagram or TikTok) are used by adolescents to interact online with the same friends they hang out with offline [88, 89]. Thus, online interactions with friends would represent an additional way to serve the same psychological and relational purposes as those in the FtF context [90–92]. Most relevant, sometimes communication is mediated by devices even when people are physically together [87]. Many multiplayer games, in particular collaborative ones, often demand player interaction outside the game environment, with players having to actively communicate to succeed [93, 94]. Taken together, this evidence suggests that the clear distinction between online and offline environments on which the POSI construct was originally based may no longer adequately capture the nuances of social interactions in contemporary society.

Because psychological constructs and hypothesized links between them (i.e., models) are not objectively existing features of reality but rather conceptual attempts to represent it, their relevance and salience tend to vary as a function of prevailing conditions. This basic principle, which applies to all constructs related to phenomena that are not directly observable, is especially relevant when it comes to Internet-related cognitive and affective experiences, as digital technology evolves incredibly rapidly. Since the POSI concept was introduced more than twenty years ago [13], its relevance needs to be discussed considering the evolution of digital technology because traditional models that

treat the Internet as a separate domain of services and tools disconnected from a “real” world could be inadequate [95]. This clear and firm separation between the online and offline social environments might be even less relevant for digital natives, who have grown up without ever encountering a communication context completely free of digital mediation [96]. For current adolescents, the online environment may not represent a less threatening alternative to the offline one, but rather one of the developmental contexts through which their sense of security, confidence, and efficacy has been shaped over time. In fact, the first evidence of positive links between online communication via instant messaging and adolescents’ social connectedness and/or well-being dates to almost twenty years ago [97, 98]. Subsequent studies suggest that social media use promotes, rather than displaces, offline interaction with friends during adolescence [89], since both socially poor and socially rich adolescents feel closer to their friends after using social media [99]. Comparable results have been reported in studies examining the impact of involvement in online games, with studies showing that playing with both offline and online friends was associated with bridging social capital [100]. In keeping with this line of reasoning, Yu and colleagues [101] have explored the moderating role of age in the association between POSI and PIU. They found that the effect of POSI on PIU was weaker in adolescents than in emerging adults. Overall, these results seem to suggest that digitally mediated and non-mediated forms of communication might coexist in a fully integrated manner. Most relevant, they do not rule out (as it was when the POSI construct was first introduced) the possibility that individuals might feel for some time safer and more comfortable interacting online in a way that does not compromise (but even enhances) their social connectedness and/or well-being. All these findings support the longstanding and widely shared perspectives that recommend avoiding the over-pathologization of common behaviors [102].

Following this line of reasoning but considering recent results concerning the role that POSI seems still to play in problematic use of the Internet [103], the present manuscript proposes that the POSI construct may need to be updated to better capture the subjective experience that can act as a risk factor for loss of control over use and impaired functioning, and to align it with established cognitive theories of psychopathology. This subjective experience is not the *temporary* experience of being *safer* and *more* comfortable online, as some degrees of POSI, particularly among young people, are somehow expected considering the increasingly blurred line between the real and virtual worlds. We suggest that POSI—as it was originally defined—is not necessarily a symptom of something clinically relevant, and it can be ‘normal’ or ‘dysfunctional’. We propose that compulsive

use develops when online interactions become, over an extended period, the predominant—rather than simply the favourite—communication form in which the individual feels safe and comfortable. This core element—the experience that the Internet is the *most or even the only safe* environment—may explain the persistent drive toward online engagement and account for the inability to reduce use, even when it results in adverse consequences. Importantly, clinically significant negative consequences—such as a substantial reduction in face-to-face social engagement—directly attributable to this preferential reliance on online contexts must be present. Such consequences should serve as a criterion for distinguishing clinically relevant POSI from a healthy, temporary reliance on online interactions as a compensatory strategy. In other words, we propose that the construct should be reformulated to become more rigid, pervasive, and inflexible, i.e., clinically relevant. Feeling more comfortable or efficacious in interacting online than face-to-face could be part of the developmental process or may emerge as a temporary and compensatory strategy during periods of increased psychological strain or reduced perceived social efficacy [95]. Yet, when the individual feels comfortable and efficacious *predominantly* in online interactions, the chance of a lack of control over social media or gaming increases. Considering the inflexibility of the experience (rather than the experience per se) and the related adverse consequence as the two clinically relevant elements of POSI is consistent with empirical findings that show that POSI – in its original definition – correlates with PIU less strongly among adolescents than adults [101]. Most importantly, this type of definition aligns with established cognitive models of psychopathology, which emphasize that cognitive distortions and maladaptive thoughts contribute to the development of disorders when they take the form of rigid, pervasive, and inflexible beliefs [104, 105].

In this updated conceptualization, could be a factor that increases the likelihood that high engagement turns into problematic engagement when it comes to social media and online gaming. On the other hand, POSI does not appear to play an etiological role in Gambling Disorder or CSD; yet the experience of feeling more comfortable and safer online could be a condition that explains the online forms of these behavioral addictions. In other words, when established risk factors are present—for example, materialism in the case of CSD [106]—individual differences in the preference for virtual environments may help clarify why, at comparable levels of addictive tendencies, some individuals express the behavior primarily in the physical world whereas others manifest it predominantly in online settings. With respect to Gambling Disorder, this perspective aligns with the position adopted in the eleventh edition of the International Classification of Diseases [107], which distinguishes between

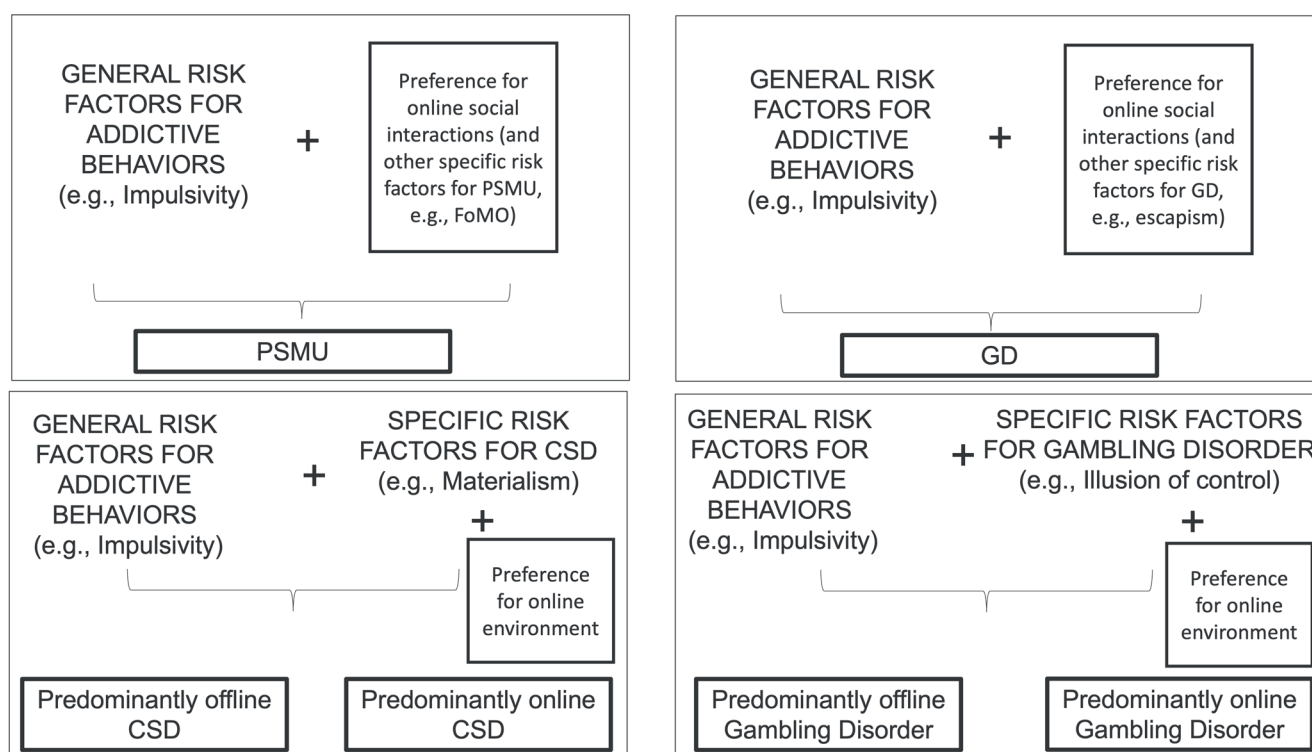


Fig. 2 A framework representation of the role of POSI in PSMU, GD, CSD and Gambling Disorder. *Note.* PSMU=Problematic Social Media Use; GD=Gaming Disorder; CSD=Compulsive-Shopping Disorder

Gambling Disorder, predominantly online and Gambling Disorder, predominantly offline—two forms that share the same diagnostic features and differ only in the context in which the gaming behavior occurs. Figure 2 shows a framework representation of the role of POSI in PSMU, GD, Gambling Disorder, and CSD.

Preference for Online Social Interactions and Conversational Artificial Intelligence: A Call for Empirical Research

In recent years, there has been growing concern about the use of artificial intelligence (AI)—particularly conversational AI—by children and adolescents. Conversational AI is designed to reproduce forms of interaction that resemble those between humans, with the goal of making exchanges with it smoother and more engaging. To achieve this, conversational AI employs strategies intended to convey empathy, drawing on tools such as natural language processing, sentiment analysis, and machine learning [108].

It has recently been highlighted that conversational AI already occupies a prominent place in young people's lives [109], particularly for emotional support, companionship, and entertainment [110]. According to a report from Common Sense Media, 72% of US adolescents have interacted with a chatbot or “AI friend”: one-third use AI for social

interactions, one quarter disclose personal information to it, and another third report preferring AI to human relationships. This is not surprising given that AI dialogue systems appear responsive, polite, and coherent to the user [111]. Moreover, this digital and artificial relationship is always adaptable, welcomes any type of confidence at any time, and “is extraordinary in its constant availability, tireless attentiveness, and apparent absence of betrayal or contradiction” [109, p.2]. In such a context, it seems important for future research to examine whether the experience of being safer and more comfortable online may constitute a risk factor for conversational AI overuse or/and a potential consequence of it. Initial empirical evidence has already shown that AI companions offer emotional and psychological benefits for individuals with unmet social and emotional needs or moderate social embeddedness [112]. Yet, the prolonged contact with a device that provides constant responsiveness, offers no real opposition, and is always available to deliver unconditional support in a gentle manner may further reinforce the sense of comfort and confidence that initially contributes to the engagement with AI. That is, AI overuse might reinforce the pathway toward that rigid, pervasive, inflexible experience (being comfortable predominantly online) that promotes the disruption and discontinuity between online and offline environments. This possibility should also be examined, given recent evidence from an experimental

study in which participants conversed with either an AI or a human, while remaining unaware of the speaker's identity [113]. The findings showed not only that participants could not correctly identify whether they had interacted with an AI or a human, but also that no significant differences in emotional or psychological responses emerged between the two types of interactions. On the one hand, this strengthens the hypothesis that conversational AI might provide an opportunity to satisfy unmet needs; on the other hand, it raises concerns that, particularly among younger individuals with more limited relational experience, such interactions may lead them to withdraw into a relational world largely confined to interactions with AI, due to the high degree of similarity with human relationships [113] and, at the same time, the illusion of advantages it appears to offer over them [109, 110].

Conclusions

The present overview is grounded in two main considerations. First, the construct of POSI has received substantial empirical support regarding its role in problematic Internet uses characterized by interpersonal interaction, most notably PSMU, and, to a lesser extent, GD. Second, computer-mediated communication has become so pervasive, routine, and deeply integrated into the everyday lives of digital natives that feeling more comfortable in online interactions does not necessarily have clinical relevance. Building on these premises, this overview has proposed that the construct of POSI may still capture a cognitive-affective experience that constitutes a key vulnerability factor, but only when such feelings of comfort and safety occur predominantly—and, in more extreme cases, almost exclusively—within digitally mediated communication and interaction, and associated with adverse consequences. We suggest operationalizing this construct in a way that emphasizes its inflexibility, in order to avoid overpathologizing a way of communicating typical of a generation that has rarely been exposed to interactional contexts fully independent of digital mediation—and, most relevant, that scientific research indicates is not, by itself, detrimental [87, 97].

Furthermore, we suggest that the preference for online environments may help explain why some problematic gamblers or compulsive shoppers tend to rely on the Internet as a preferred means of accessing the object of their addiction. We suggest that future research should operationalize this construct to examine whether the subjective experience of feeling comfortable and safe predominantly in online contexts interacts with well-established risk factors in shaping the developmental pathway toward predominantly online Gambling Disorder and predominantly online CSD.

Finally, we emphasize that future research should begin to focus on longitudinal studies examining the relationship between conversational AI and POSI, given the evidence showing the difficulties humans encounter in determining whether the interlocutor is another human being or a machine [113], and the risks associated with the potential discovery that a virtual relationship had not, in fact, involved another human on the other side.

Key References

•• Moretta T, Wegmann E. Toward the classification of social media use disorder: Clinical characterization and proposed diagnostic criteria. *Addict Behav Rep.* 2025;21:100603. <https://doi.org/10.1016/j.abrep.2025.100603>.

○ This paper supports the clinical relevance and potential diagnostic role of POSI in problematic social media use.

•• Fioravanti G, Bocci Benucci S, Ghinassi S. Psychological risk factors for problematic social network use: An overview of systematic reviews and meta-analyses. *Addict Behav Rep.* 2025;21:100600. <https://doi.org/10.1016/j.abrep.2025.100600>.

○ This paper identifies POSI as a robust factor associated with problematic social media use across all studies that included it.

•• Castro CM, Neto DD. Profiling gamers: The role of mental health, attachment and social factors in gaming behaviors. *Addict Behav.* 2025;169:108390. <https://doi.org/10.1016/j.addbeh.2025.108390>.

○ This paper supports the relevance of POSI in distinguishing dysregulated gaming profiles.

Human and Animal Rights and Informed Consent No animal or human subjects by the authors were used in this study.

Authors' Contributions SC and SG planned the manuscript's outline and aims of the manuscript. SC wrote the first draft of the manuscript and prepared the figure. JB and SC provided extensive conceptual input and reviewed the manuscript.

Funding Open access funding provided by Università degli Studi di Firenze within the CRUI-CARE Agreement. The authors did not receive support from any organization for the submitted work.

Data Availability No datasets were generated or analysed during the current study.

Declarations

Competing interests The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Griffiths MD. The acquisition, development, and maintenance of fruit machine gambling in adolescents. *J Gambl Stud.* 1990;6(3):193–204. <https://doi.org/10.1007/BF01014578>.
- Griffiths MD. Addiction to fruit machines: A preliminary study among young males. *J Gambl Stud.* 1990;6(2):113–26. <https://doi.org/10.1007/BF01013492>.
- Griffiths MD. Amusement machine playing in childhood and adolescence: A comparative analysis of video games and fruit machines. *J Adolesc.* 1991;14(1):53–73. [https://doi.org/10.1016/0140-1971\(91\)90045-S](https://doi.org/10.1016/0140-1971(91)90045-S).
- Griffiths M. Fruit machine addiction in adolescence: A case study. *J Gambl Stud.* 1993;9(4):387–99. <https://doi.org/10.1007/BF01014629>.
- Griffiths M. Towards a risk factor model of fruit machine addiction: A brief note. *J Gambl Stud.* 1995;11(3):343–6. <https://doi.org/10.1007/BF02104797>.
- Young KS. Internet Addiction: The Emergence of a New Clinical Disorder. *Cyberpsychol Behav.* 1998;1(3):237–44. <https://doi.org/10.1089/cpb.1998.1.237>.
- Young KS. Psychology of Computer Use: XL. Addictive Use of the Internet: A Case That Breaks the Stereotype. *Psychol Rep.* 1996;79(3):899–902. <https://doi.org/10.2466/pr0.1996.79.3.899>.
- Griffiths M. Gambling on the internet: A brief note. *J Gambl Stud.* 1996;12(4):471–3. <https://doi.org/10.1007/BF01539190>.
- Caplan SE. Theory and measurement of generalized problematic Internet use: A two-step approach. *Comput Hum Behav.* 2010;26(5):1089–97. <https://doi.org/10.1016/j.chb.2010.03.012>.
- Griffiths M. A 'components' model of addiction within a biopsychosocial framework. *J Subst Use.* 2005;10(4):191–7. <https://doi.org/10.1080/14659890500114359>.
- Davis RA. A cognitive-behavioral model of pathological Internet use. *Comput Hum Behav.* 2001;17(2):187–95. [https://doi.org/10.1016/S0747-5632\(00\)00041-8](https://doi.org/10.1016/S0747-5632(00)00041-8).
- Caplan SE. Problematic Internet use and psychosocial well-being: development of a theory-based cognitive-behavioral measurement instrument. *Comput Hum Behav.* 2002;18(5):553–75. [https://doi.org/10.1016/S0747-5632\(02\)00004-3](https://doi.org/10.1016/S0747-5632(02)00004-3).
- Caplan SE. Preference for Online Social Interaction: A Theory of Problematic Internet Use and Psychosocial Well-Being. *Commun Res.* 2003;30(6):625–48. <https://doi.org/10.1177/0093650203257842>.
- Caplan SE. A Social Skill Account of Problematic Internet Use. *J Commun.* 2005;55(4):721–36. <https://doi.org/10.1111/j.1460-2466.2005.tb03019.x>.
- Brand M, Rumpf HJü, Demetrovics Z, Müller A, Stark R, King DL, et al. Which conditions should be considered as disorders in the International Classification of Diseases (ICD-11) designation of other specified disorders due to addictive behaviors? *J Behav Addict.* 2022. <https://doi.org/10.1556/2006.2020.00035>.
- Walther JB. Computer-Mediated, Communication. Impersonal, Interpersonal, and Hyperpersonal Interaction. *Commun Res.* 1996;23(1):3–43. <https://doi.org/10.1177/009365096023001001>.
- Walther JB. Selective self-presentation in computer-mediated communication: Hyperpersonal dimensions of technology, language, and cognition. *Comput Hum Behav.* 2007;23(5):2538–57. <https://doi.org/10.1016/j.chb.2006.05.002>.
- LaRose R, Lin CA, Eastin MS. Unregulated Internet Usage: Addiction, Habit, or Deficient Self-Regulation? *Media Psychol.* 2003;5(3):225–53. https://doi.org/10.1207/S1532785XMEP0503_01.
- Laconi S, Kaliszewska-Czeremska K, Tricard N, Chabrol H, Kuss DJ. The Generalized Problematic Internet Use Scale-2 in a French sample: Psychometric evaluation of the theoretical model. *L'Encéphale.* 2018;44(3):192–9. <https://doi.org/10.1016/j.encep.2017.09.001>.
- Gámez-Guadix M, Villa-George FI, Calvete E. Measurement and analysis of the cognitive-behavioral model of generalized problematic Internet use among Mexican adolescents. *J Adolesc.* 2012;35(6):1581–91. <https://doi.org/10.1016/j.adolescence.2012.06.005>.
- Assunção RS, Matos PM. The Generalized Problematic Internet Use Scale 2: Validation and test of the model to Facebook use. *J Adolesc.* 2017;54(1):51–9. <https://doi.org/10.1016/j.adolescence.2016.11.007>.
- Gámez-Guadix M, Orue I, Calvete E. Evaluation of the cognitive-behavioral model of generalized and problematic Internet use in Spanish adolescents. *Psicothema.* 2013;3(25):299–306. <https://doi.org/10.7334/psicothema2012.274>.
- Marzo JC, García-Oliva C, Piqueras JA. Factorial analysis and gender invariance of GPIUS2 scale and evaluation of Caplan's cognitive-behavioral model of problematic Internet use in adolescents. *Psicol.* 2022;38(3):469–77. <https://doi.org/10.6018/analesps.508461>.
- Casale S, Fiovaranti G, Caplan S. Online Disinhibition: Precursors and Outcomes. *J Media Psychol.* 2015;27(4):170–7. <https://doi.org/10.1027/1864-1105/a000136>.
- Moretta T, Buodo G. Modeling Problematic Facebook Use: Highlighting the role of mood regulation and preference for online social interaction. *Addict Behav.* 2018;87:214–21. <https://doi.org/10.1016/j.addbeh.2018.07.014>.
- Balcerowska J, Bereznowski P. The Generalized Problematic Internet Use Scale 2 in a Polish sample: psychometric validation and relationship with specific Internet-related disorders and psychosocial functioning. *Curr Issues Personal Psychol.* 2023. <https://doi.org/10.5114/cipp/151869>.
- Yoshimura S, Shibata M, Kyuragi Y, Kobayashi K, Aki M, Murai T et al. The Japanese version of the Generalized Problematic Internet Use Scale 2 (GPIUS2): Psychometric evaluation and analysis of the theoretical model. Concerto C, editor. *PLOS ONE.* 2022;17(11):e0273895. <https://doi.org/10.1371/journal.pone.0273895>.
- Cizkowicz B. Validation of Theoretical and Measurement Model of the Generalized Problematic Internet Use Scale 2 in a Polish Sample. *Rocz Psychol.* 2022;25(1):67–85. <https://doi.org/10.18290/rpsych2022.0004>.
- Goh ZH, Tandoc EC, Chan VX. Alone and lonely? How physical and perceived isolation can lead to problematic internet use.

- Behav Inf Technol. 2023;42(15):2588–600. <https://doi.org/10.1080/0144929X.2022.2134825>.
30. Hutchins N, Allen A, Curran M, Kannis-Dymand L. Social anxiety and online social interaction. *Aust Psychol*. 2021;56(2):142–53. <https://doi.org/10.1080/00050067.2021.1890977>.
 31. Gioia F, Boursier V. Emotion dysregulation and adolescents' preference for online social interactions: The moderating role of gender. In: *CEUR Workshop Proceedings*. 2019. Available from: <http://ceur-ws.org/Vol-2524/paper23.pdf>
 32. Ye Y, Lin L. Examining Relations between Locus of Control, Loneliness, Subjective Well-Being, and Preference for Online Social Interaction. *Psychol Rep*. 2015;116(1):164–75. <https://doi.org/10.2466/07.09.PR0.116k14w3>.
 33. Casale S, Tella L, Fioravanti G. Preference for online social interactions among young people: Direct and indirect effects of emotional intelligence. *Personal Individ Differ*. 2013;54(4):524–9. <https://doi.org/10.1016/j.paid.2012.10.023>.
 34. Fioravanti G, Dèttore D, Casale S. Adolescent Internet Addiction: Testing the Association Between Self-Esteem, the Perception of Internet Attributes, and Preference for Online Social Interactions. *Cyberpsychology Behav Soc Netw*. 2012;15(6):318–23. <https://doi.org/10.1089/cyber.2011.0358>.
 35. Piccoli V, Carnaghi A, Bianchi M, Grassi M. Perceived-Social Isolation and Cyberbullying Involvement: The Role of Online Social Interaction. *Int J Cyber Behav Psychol Learn*. 2022;12(1):1–14. <https://doi.org/10.4018/IJCBPL.313948>.
 36. Grieve R, Lang CP, March E. More than a preference for online social interaction: Vulnerable narcissism and phubbing. *Personal Individ Differ*. 2021;175:110715. <https://doi.org/10.1016/j.paid.2021.110715>.
 37. Mýlek V, Dedkova L, Schouten AP. Adolescents' Online Communication and Self-Disclosure to Online and Offline Acquaintances: Differential Effects of Social Anxiety and Depressed Moods. *J Media Psychol*. 2024;36(2):132–43. <https://doi.org/10.1027/1864-1105/a000383>.
 38. De López MC, Pastor Y, Catalina B. Relaciones afectivo-sexuales en línea de los adolescentes: factores explicativos de sus prácticas y experiencias. *Aloma Rev Psicol Ciènc Educ Esport*. 2024;42(1):26–34. <https://doi.org/10.51698/aloma.2024.42.1.26-34>.
 39. Cheon J, Chae LD, Lee JY. The Effects of Body Image and SNS Body Image on SNS Photo-Editing Tendency. *J Technol Behav Sci*. 2025;10(1):28–38. <https://doi.org/10.1007/s41347-024-00405-x>.
 40. Sarkar K, Badir YF. Preference for online social interaction and its psychological costs: Examining technostress and computer anxiety among middle-aged adults. *Telemat Inf Rep*. 2026;21:100297. <https://doi.org/10.1016/j.teler.2026.100297>.
 41. You Z, Tian Y, Kong F, Zhou Z, Zheng Y. Development of the Preference for Online Social Interaction Scale for Chinese adolescents. *Soc Behav Personal Int J*. 2016;44(6):1005–14. <https://doi.org/10.2224/sbp.2016.44.6.1005>.
 42. Pontes HM, Taylor M, Stavropoulos V. Beyond Facebook Addiction: The Role of Cognitive-Related Factors and Psychiatric Distress in Social Networking Site Addiction. *Cyberpsychology Behav Soc Netw*. 2018;21(4):240–7. <https://doi.org/10.1089/cyber.2017.0609>.
 43. Balcerowska JM, Brailovskaia J. Psychopathological symptoms and social networking sites addiction in Poland and Germany: The role of fear of missing out and preference for online social interaction. *Comput Hum Behav*. 2024;156:108240. <https://doi.org/10.1016/j.chb.2024.108240>.
 44. Casale S, Primi C, Fioravanti G. Generalized Problematic Internet Use Scale 2: update on the psychometric properties among Italian young adults. In: Riva G, Wiederhold BK, Cipresso P, editors. *The Psychology of Social Networking: Identity and Relationships in Online Communities*. De Gruyter Open; 2016. pp. 202–16.
 45. Pérez-Torres V. Social media: a digital social mirror for identity development during adolescence. *Curr Psychol*. 2024;43(26):22170–80. <https://doi.org/10.1007/s12144-024-05980-z>.
 46. Nagar K, Singh G, Singh R. Mediating Effect of WhatsApp Addiction Between Social Loneliness and Preference for Online Social Interaction: A Cross-cultural Study. *Glob Bus Rev*. 2025;26(5):1216–38. <https://doi.org/10.1177/09721509211055603>.
 47. Huang YT, Gong AD. Too vulnerable to resist: Problematic use of dating apps associated with social appearance anxiety, social interaction anxiety, and rejection sensitivity. *Comput Hum Behav*. 2025;165:108566. <https://doi.org/10.1016/j.chb.2025.108566>.
 48. Hu J, Rui JR. The relationship between preference for online social interaction and affective well-being via compulsive dating app use: The moderating role of algorithmic beliefs. *Cyberpsychology J Psychosoc Res Cyberspace*. 2023;17(4). <https://doi.org/10.5817/CP2023-4-2>.
 49. Svicher A, Fioravanti G, Casale S. Identifying the central symptoms of problematic social networking sites use through network analysis. *J Behav Addict*. 2021;10(3):767–78. <https://doi.org/10.1556/2006.2021.00053>.
 50. Wegmann E, Brand M. A narrative Overview About Psychosocial Characteristics as Risk Factors of a Problematic Social Networks Use. *Curr Addict Rep*. 2019;6(4):402–9. <https://doi.org/10.1007/s40429-019-00286-8>.
 51. Casale S, Ghinassi S, Bocci Benucci S. Problematic social media use: Which symptoms are necessary conditions for reduced control and negative outcomes to occur over time? *J Behav Addict*. 2026;10. <https://doi.org/10.1556/2006.2026.00079>.
 52. Moretta T, Wegmann E. Toward the classification of social media use disorder: Clinical characterization and proposed diagnostic criteria. *Addict Behav Rep*. 2025;21:100603. <https://doi.org/10.1016/j.abrep.2025.100603>.
 53. Fioravanti G, Bocci Benucci S, Ghinassi S. Psychological risk factors for problematic social network use: An overview of systematic reviews and meta-analyses. *Addict Behav Rep*. 2025;21:100600. <https://doi.org/10.1016/j.abrep.2025.100600>.
 54. Saunders JB, Rumpf HJ, Carragher N, Poznyak V. The Development of and Rationale for Gaming Disorder in ICD-11 and a Review of Available Assessment Tools. *Curr Addict Rep*. 2025;12(1):18. <https://doi.org/10.1007/s40429-025-00631-0>.
 55. De Kort YAW, Ijsselstein WA. People, places, and play: player experience in a socio-spatial context. *Comput Entertain*. 2008;6(2):1–11. <https://doi.org/10.1145/1371216.1371221>.
 56. Emmerich K, Masuch M. The Impact of Game Patterns on Player Experience and Social Interaction in Co-Located Multiplayer Games. In: *Proceedings of the Annual Symposium on Computer-Human Interaction in Play*. Amsterdam The Netherlands: ACM; 2017 Accessed 2026. pp. 411–22. <https://doi.org/10.1145/3116595.3116606>.
 57. Griffiths MD, Davies MNO. Videogame addiction: Does it exist? In: Goldstein J, Raessens J, editors. *Handbook of computer game studies*. MIT Press; 2005. pp. 359–68.
 58. Casale S, Fioravanti G. Satisfying needs through Social Networking Sites: A pathway towards problematic Internet use for socially anxious people? *Addict Behav Rep*. 2015;1:34–9. <https://doi.org/10.1016/j.abrep.2015.03.008>.
 59. Gioia F, Colella GM, Boursier V. Evidence on Problematic Online Gaming and Social Anxiety over the Past Ten Years: a Systematic Literature Review. *Curr Addict Rep*. 2022;9(1):32–47. <https://doi.org/10.1007/s40429-021-00406-3>.
 60. Haagsma MC, Caplan SE, Peters O, Pieterse ME. A cognitive-behavioral model of problematic online gaming in adolescents

- aged 12–22 years. *Comput Hum Behav.* 2013;29(1):202–9. <https://doi.org/10.1016/j.chb.2012.08.006>.
61. Männikkö N, Billieux J, Käätäinen M. Problematic digital gaming behavior and its relation to the psychological, social and physical health of Finnish adolescents and young adults. *J Behav Addict.* 2015;4(4):281–8. <https://doi.org/10.1556/2006.4.2015.040>.
 62. Marino C, Canale N, Vieno A, Caselli G, Scacchi L, Spada MM. Social anxiety and Internet gaming disorder: The role of motives and metacognitions. *J Behav Addict.* 2020;9(3):617–28. <https://doi.org/10.1556/2006.2020.00044>.
 63. Castro CM, Neto DD. Profiling gamers: The role of mental health, attachment and social factors in gaming behaviors. *Addict Behav.* 2025;169:108390. <https://doi.org/10.1016/j.addbeh.2025.108390>.
 64. Liu M, Peng W. Cognitive and psychological predictors of the negative outcomes associated with playing MMOGs (massively multiplayer online games). *Comput Hum Behav.* 2009;25(6):1306–11. <https://doi.org/10.1016/j.chb.2009.06.002>.
 65. Döring NM. The Internet's impact on sexuality: A critical review of 15 years of research. *Comput Hum Behav.* 2009;25(5):1089–101. <https://doi.org/10.1016/j.chb.2009.04.003>.
 66. Cooper A, Griffin-Shelley E, Delmonico DL, Mathy RM. Online Sexual Problems: Assessment and Predictive Variables. *Sex Addict Compulsivity.* 2001;8(3–4):267–85. <https://doi.org/10.1080/107201601753459964>.
 67. McArthur N, Twist MLC. The rise of digisexuality: therapeutic challenges and possibilities. *Sex Relatsh Ther.* 2017;32(3–4):334–44. <https://doi.org/10.1080/14681994.2017.1397950>.
 68. Döring N, Krämer N, Mikhailova V, Brand M, Krüger THC, Vowe G. Sexual Interaction in Digital Contexts and Its Implications for Sexual Health: A Conceptual Analysis. *Front Psychol.* 2021;12:769732. <https://doi.org/10.3389/fpsyg.2021.769732>.
 69. Ashton S, McDonald K, Kirkman M. What does 'pornography' mean in the digital age? Revisiting a definition for social science researchers. *Porn Stud.* 2019;6(2):144–68. <https://doi.org/10.1080/23268743.2018.1544096>.
 70. Elsey JWB, Van Andel K, Kater RB, Reints IM, Spiering M. The impact of virtual reality versus 2D pornography on sexual arousal and presence. *Comput Hum Behav.* 2019;97:35–43. <https://doi.org/10.1016/j.chb.2019.02.031>.
 71. Martinez-Serra A, Cardenal AS. Who watches porn? Demographic insights from web tracking data. *Comput Hum Behav.* 2025;172:108731. <https://doi.org/10.1016/j.chb.2025.108731>.
 72. Gola M, Lewczuk K, Skorko M, What, Matters. Quantity or Quality of Pornography Use? Psychological and Behavioral Factors of Seeking Treatment for Problematic Pornography Use. *J Sex Med.* 2016;13(5):815–24. <https://doi.org/10.1016/j.jsxm.2016.02.169>.
 73. Ince C, Antons S, Ashton S, Borgogna NC, Brand M, Briken P, et al. Compulsive sexual behavior disorder (CSBD) and problematic pornography use (PPU): A comprehensive, interdisciplinary, and expert-informed narrative review with suggested future directions. *J Behav Addict.* 2026;15(1):32–98. <https://doi.org/10.1556/2006.2025.00337>.
 74. Vieira C, Griffiths MD. Problematic Pornography Use and Mental Health: A Systematic Review. *Sex Health Compulsivity.* 2024;31(3):207–47. <https://doi.org/10.1080/26929953.2024.2348624>.
 75. Rose S, Dhandayudham A. Towards an understanding of Internet-based problem shopping behaviour: The concept of online shopping addiction and its proposed predictors. *J Behav Addict.* 2014;3(2):83–9. <https://doi.org/10.1556/JBA.3.2014.003>.
 76. Niedermoser DW, Petitjean S, Schweinfurth N, Wirz L, Ankli V, Schilling H, et al. Shopping addiction: A brief review. *Pract Innov.* 2021;6(3):199–207. <https://doi.org/10.1037/pri0000152>.
 77. Gainsbury S. Internet gambling: current research findings and implications. New York, N.Y.: Springer; 2012. (SpringerBriefs in behavioral medicine).
 78. Gainsbury SM, Russell A, Hing N, Wood R, Lubman DI, Blaszczynski A. The prevalence and determinants of problem gambling in Australia: Assessing the impact of interactive gambling and new technologies. *Psychol Addict Behav.* 2014;28(3):769–79. <https://doi.org/10.1037/a0036207>.
 79. Hing N, Gainsbury SM, Blaszczynski A, Wood R, Lubman DL, Russell A. Interactive Gambling [Internet]. Gambling Research Australia; 2014 Accessed 2026. <https://doi.org/10.13140/2.1.1381.6648>.
 80. American Gaming Association. State of the states 2006: The American Gaming Association survey of casino entertainment [Internet]. American Gaming Association. Available from: <https://www.americangaming.org/wp-content/uploads/2017/10/2017-State-of-the-States.pdf>
 81. Wood RT, Williams RJ, Lawton PK. Why do Internet gamblers prefer online versus land-based venues? Some preliminary findings and implications. *J Gambl Issues.* 2007;20. <https://doi.org/10.4309/jgi.2007.20.11>.
 82. Kardefelt-Winther D. A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Comput Hum Behav.* 2014;31:351–4. <https://doi.org/10.1016/j.chb.2013.10.059>.
 83. González-Bueso V, Santamaría J, Fernández D, Merino L, Montero E, Ribas J. Association between Internet Gaming Disorder or Pathological Video-Game Use and Comorbid Psychopathology: A Comprehensive Review. *Int J Environ Res Public Health.* 2018;15(4):668. <https://doi.org/10.3390/ijerph15040668>.
 84. Wei HT, Chen MH, Huang PC, Bai YM. The association between online gaming, social phobia, and depression: an internet survey. *BMC Psychiatry.* 2012;12(1):92. <https://doi.org/10.1186/1471-244X-12-92>.
 85. World Health Organization. Clinical Descriptions and Diagnostic Requirements for ICD-11 Mental, Behavioural and Neurodevelopmental Disorders. 1st ed. Geneva: World Health Organization; 2024.
 86. Schlossarek S, Schmidt H, Bischof A, Bischof G, Brandt D, Borgwardt S, et al. Psychometric Properties of Screening Instruments for Social Network Use Disorder in Children and Adolescents: A Systematic Review. *JAMA Pediatr.* 2023;177(4):419. <https://doi.org/10.1001/jamapediatrics.2022.5741>.
 87. Valkenburg PM, Peter J. Internet Communication and Its Relation to Well-Being: Identifying Some Underlying Mechanisms. *Media Psychol.* 2007;9(1):43–58. <https://doi.org/10.1080/15213260709336802>.
 88. Angelini F, Gini G, Marino C, Van Den Eijnden R. Social media features, perceived group norms, and adolescents' active social media use matter for perceived friendship quality. *Front Psychol.* 2024;15:1222907. <https://doi.org/10.3389/fpsyg.2024.1222907>.
 89. Steinsbekk S, Bjørklund O, Valkenburg P, Nesi J, Wichstrøm L. The new social landscape: Relationships among social media use, social skills, and offline friendships from age 10–18 years. *Comput Hum Behav.* 2024;156:108235. <https://doi.org/10.1016/j.chb.2024.108235>.
 90. Angelini F, Marino C, Gini G. Friendship quality in adolescence: the role of social media features, online social support and e-motions. *Curr Psychol.* 2023;42(30):26016–32. <https://doi.org/10.1007/s12144-022-03564-3>.
 91. Moreno MA, Binger K, Minich M, Zhao Q, Eickhoff J. Adolescent Digital Technology Interactions and Importance: Associations with Depression and Well-Being. *Cyberpsychology Behav Soc Netw.* 2022;cyber.2021.0294. <https://doi.org/10.1089/cyber.2021.0294>

92. Yau JC, Reich SM. Are the Qualities of Adolescents' Offline Friendships Present in Digital Interactions? *Adolesc Res Rev*. 2018;3(3):339–55. <https://doi.org/10.1007/s40894-017-0059-y>.
93. Depping AE, Johanson C, Mandryk RL. Designing for Friendship: Modeling Properties of Play, In-Game Social Capital, and Psychological Well-being. In: *Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play* [Internet]. Melbourne VIC Australia: ACM; 2018 Accessed 2026. pp. 87–100. <https://doi.org/10.1145/3242671.3242702>
94. Depping AE, Mandryk RL. Cooperation and Interdependence: How Multiplayer Games Increase Social Closeness. In: *Proceedings of the Annual Symposium on Computer-Human Interaction in Play* [Internet]. Amsterdam The Netherlands: ACM; 2017 Accessed 2026. pp. 449–61. <https://doi.org/10.1145/3116595.3116639>
95. Schimmenti A. Beyond addiction: rethinking problematic Internet use from a motivational framework. *Clin Neuropsychiatry*. 2023;20(6):471–8. <https://doi.org/10.36131/cnforiteditore20230601>.
96. Internet Matters Team. Revealed: The secret life of six year olds online. Internet Matters; 2017.
97. Bessière K, Kiesler S, Kraut R, Boneva BS. Effects of Internet use and social resources on changes in depression. *Inf Commun Soc*. 2008;11(1):47–70. <https://doi.org/10.1080/13691180701858851>.
98. Valkenburg PM, Peter J. Preadolescents' and adolescents' online communication and their closeness to friends. *Dev Psychol*. 2007;43(2):267–77. <https://doi.org/10.1037/0012-1649.43.2.267>.
99. Pouwels JL, Valkenburg PM, Beyens I, Van Driel II, Keijsers L. Some socially poor but also some socially rich adolescents feel closer to their friends after using social media. *Sci Rep*. 2021;11(1):21176. <https://doi.org/10.1038/s41598-021-99034-0>.
100. Meng J, Williams D, Shen C. Channels matter: Multimodal connectedness, types of co-players and social capital for Multiplayer Online Battle Arena gamers. *Comput Hum Behav*. 2015;52:190–9. <https://doi.org/10.1016/j.chb.2015.06.007>.
101. Yu Q, Zhang L, Wu S, Guo Y, Jin S, Sun Y. The influence of juvenile preference for online social interaction on problematic Internet use: The moderating effect of sibling condition and the moderated moderating effect of age cohort. *Comput Hum Behav*. 2017;68:345–51. <https://doi.org/10.1016/j.chb.2016.11.026>.
102. Billieux J, Schimmenti A, Khazaal Y, Maurage P, Heeren A. Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *J Behav Addict*. 2015;4(3):119–23. <https://doi.org/10.1556/2006.4.2015.009>.
103. Angelini F, Koning IM, Gini G, Marino C, Van Den Eijnden RJM. Adolescent social media use profiles: A longitudinal study of friendship quality and socio-motivational factors. *Comput Hum Behav*. 2026;177:108880. <https://doi.org/10.1016/j.chb.2025.108880>.
104. Beck AT. *Cognitive Therapy and the emotional disorders*. 4. printing. Madison: Intern. Univ.; 1986. p. 356.
105. Beck AT, Haigh EAP. *Advances in Cognitive Theory and Therapy: The Generic Cognitive Model*. *Annu Rev Clin Psychol*. 2014;10(1):1–24. <https://doi.org/10.1146/annurev-clinpsy-032813-153734>.
106. Barbieri G, Mosto G, Rogier G. Materialism and Compulsive Buying: A Systematic Review and Meta-analysis. *Int J Ment Health Addict*. 2025. <https://doi.org/10.1007/s11469-025-01478-2>.
107. World Health Organization. *International Classification of Diseases 11th Revision (ICD-11)* [Internet]. World Health Organization. 2022. Available from: <https://icd.who.int/>
108. Bond R, Engel F, Fuchs M, Hemmje M, Mc Kevitt P, McTear M et al. Digital empathy secures Frankenstein's monster. In: *Collaborative european research conference*. In: *Proceedings of the 5th Collaborative European Research Conference (CERC 2019)* [Internet]. Darmstadt, Germany: Collaborative European Research Conference; 2019. pp. 335–49. Available from: <http://eur-ws.org/Vol-2348/paper24.pdf>
109. Mouhoud T. From imaginary friends to artificial companions: growing up with AI. *Eur Child Adolesc Psychiatry*. 2025. <https://doi.org/10.1007/s00787-025-02901-8>.
110. Englander EK. 4.1 Research on AI Relationships. *J Am Acad Child Adolesc Psychiatry*. 2025;64(10):S6. <https://doi.org/10.1016/j.jaac.2025.07.189>.
111. McTear M. *Conversational AI. Dialogue Systems, Conversational Agents, and Chatbots*. 1st ed. 2021. Cham: Springer International Publishing; 2021. 1 p. (Synthesis Lectures on Human Language Technologies). <https://doi.org/10.1007/978-3-031-02176-3>
112. Nakagomi A, Akutsu Y, Yasuoka M, Abe N, Ihara S, Teroh T, et al. AI companions and subjective well-being: Moderation by social connectedness and loneliness. *Technol Soc*. 2026;85:103229. <https://doi.org/10.1016/j.techsoc.2026.103229>.
113. Kober SE, Streit S, Wood G. AI or human? Exploring the effects of user awareness in conversational dynamics with virtual avatars. *Comput Hum Behav*. 2026;181:108984. <https://doi.org/10.1016/j.chb.2026.108984>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.